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(71) Applicant: 000005821
Matsushita Electric Industrial Co., Ltd.
1006 Oaza Kadoma, Kadoma-shi, Osaka

(71) Applicant: 000002185
Sony Corporation
6-7-35 Kitashinagawa, Shinagawa-ku, Tokyo

(72) Inventor: Shigeru Yokoji
Matsushita Electric Industrial Co., Ltd.
1006 Oaza Kadoma, Kadoma-shi, Osaka

(72) Inventor: Hiroshi Matsui
Matsushita Electric Industrial Co., Ltd.
1006 Oaza Kadoma, Kadoma-shi, Osaka

(74) Agent: Yoshihiro Morimoto [name not confirmed], Patent Attorney

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(54) [Title of invention]: Rotational control electronic part with push switch

(57) [Abstract]

[Object] The object is to provide a rotational control electronic part with push switch whereby horizontal rotation and push operation can be separately controlled with a single knob.

[Constitution] Rotational part 2 and push switch 3 can be independently and reliably controlled as a result of a constitution wherein horizontal rotational control knob 17 is mounted on attachment plate 1 such that rotational part 2 can rotate horizontally, and an electrical signal for rotational part 2 is delivered to a terminal of attachment plate 1 via elastic contact legs 11 and 12, and contact plate 9; in addition, rotational part 2 is horizontally rotated a predetermined distance, and push switch 3, which is attached onto attachment plate 1, is operated.

[See original for graphic.]

19: helical screw spring

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[Claims]

[Claim 1] A rotational control electronic part with push switch comprising a rotational part that generates an electrical signal as a result of a control knob being horizontally rotated; and a contact attachment plate that holds the entire rotational part such that it can move horizontally in a predetermined range, and has means of transmitting the electrical signal via a sliding contact point between the rotational part and this [i.e., the contact attachment plate]; and a spring that in ordinary status presses the rotational part in a predetermined horizontal direction; and a push switch that is arranged on the contact attachment plate such that it is operated by pushing the rotational part via the control knob, in resistance to the biasing force of the spring.

[Claim 2] The rotational control electronic part with push switch recited in Claim 1, constituted such that a rotating object of the rotational part rotates, accompanied by a sensation as of clicking into place, as a result of the nib of an elastic leg, which is extended from the case side of the rotational part, coming into contact with a local irregularity that is arranged radially on the upper surface of the rotating object of the rotational part.

[Claim 3] The rotational control electronic part with push switch recited in Claims 1 and 2, comprising an elastic contact leg of the rotational part, for electrical signal generation, and an elastic metal plate that is identical to the elastic contact leg, for electrical signal transmission, between the rotational part and this [i.e., the contact attachment plate].

[Detailed description of the invention]

[0001]

[Industrial field of application] The present invention mainly concerns rotational control electronic parts that are used for remote controls for various types of electronic devices, as well as for portable electronic devices, and that are operated by horizontal rotation of a control knob, as well as by push control.

[0002]

[Prior art] Conventionally, in devices that employ this type of electronic part, an electronic part such as an encoder or the like, which controls horizontal rotation, and a switch or the like that is push controlled, are each arranged separately and two control knobs are attached as separate parts.

[0003]

[Problem that the invention is to solve] However, the locations whereon control knobs can be mounted are ordinarily limited, because of the need to reduce the sizes of remote controls and portable electronic devices; attaching separate control knobs for horizontal rotation and push control is disadvantageous for equipment size reduction, and when controlling both related functions using knobs, it is necessary to operate two knobs, which is inconvenient from the usage standpoint.

[0004] The object is to provide a rotational control electronic part with push switch whereby horizontal rotation and push operation can be separately controlled with a single knob.

[0005]

[Means for solving the problem] The rotational control electronic part with push switch of the present invention is characterized in that

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it comprises a rotational part that generates an electrical signal as a result of a control knob being horizontally rotated; and a contact attachment plate that holds the entire rotational part such that it can move horizontally in a predetermined range, and has means of transmitting the electrical signal via a sliding contact point between the rotational part and the contact attachment plate; and a spring that in ordinary status presses the rotational part in a predetermined horizontal direction; and a push switch that is arranged on the contact attachment plate such that it is operated by pushing the rotational part via the control knob, in resistance to the biasing force of the spring.

[0006]

[Operation] As a result of this constitution, a horizontal rotational control knob is mounted on a contact attachment plate in a rotational control electronic part with push switch such that the rotational part, with a horizontal control knob attached, can move horizontally, an electrical signal for this is delivered to a terminal of the attachment plate via a sliding contact point, and the rotational part moves only a predetermined distance in a horizontal direction, so that the push switch that is attached onto this contact attachment plate can be operated, and the horizontal rotational part and push switch can be independently and reliably controlled.

[0007]

[Embodiment] In the following, a rotational encoder with a push switch that is an embodiment of the rotational control electronic part with push switch of the present invention is described, based on Figures 1–9.

[0008] In the rotational encoder with a push switch of the present invention, rotational encoder part 2 and push switch 3 are arranged on contact attachment plate 1, as shown in Figure 1, and push switch 3 is affixed such that it cannot move, so that rotational encoder part 2 can move horizontally in a predetermined range.

[0009] Note that in the following description, contact attachment plate 1 is abbreviated as attachment plate 1, rotational encoder part 2 as encoder 2, and push switch 3 as switch 3.

[0010] As shown in Figure 2, indentation 5, having guide rails 4 for encoder 2 movement, in a flat molded resin object, as well as indentation 7, with cut-off wall 6 for the purpose of affixing switch 3, and contact plate 9, having terminal 8 for the purpose of transmitting electrical signals from encoder 2 to the exterior, are arranged on attachment plate 1.

[0011] As shown in Figures 3 and 4, encoder 2 comprises molded resin box-shaped case 10, which is fitted into indentation 5 in attachment plate 1, and held such that it can move in a predetermined range in a horizontal direction (the direction indicated by arrow H1 in Figures 1 and 4), in accordance with guide rails 4; elastic contact legs 11 and 12, which protrude, respectively, upward and downward from elastic contact object 35, which is attached by insert molding to the bottom surface of box-shaped case 10; molded resin rotating object 15, which is rotatably affixed by cylindrical axis 13, which is incorporated into the center of box-shaped case 10, and having radial contact plate 14, which is discoid, and to the lower surface of which

elastic contact leg 11 is elastically joined; and circumferential control type discoid control knob 17, which is attached by screw 16 thereabove, such that rotating object can be rotationally manipulated; the side surface of box-shaped case 10 is pushed

in a horizontal direction by helical screw spring 19, which is positioned at pin-shaped protuberance 18 on attachment plate 1 (see Figure 2 and 6); in addition to being biased such that it is distant from switch 3 in ordinary status, elastic contact leg 12, protruding downward from the bottom surface of box-shaped case 10, is elastically joined to contact plate 9 of attachment plate 1.

[0012] As shown In Figure 4, switch 3 is fitted and affixed into indentation 7 of attachment plate 1, such that control button 20 faces encoder 2, and the rear edge comes into contact with cut-off wall 6.

[0013] Drive protrusion 21, which is incorporated into box-shaped case 10 of encoder 2, then comes into contact with the front edge of control button 20 of switch 3. Although the rotational encoder with a push switch of the present embodiment is constituted as described above, when it is mounted on an electronic device, legs 1A and 1B on the lower side of attachment plate 1, connection terminals 8 of encoder 2, and connection terminal 22 of switch 3, are connected by being inserted and soldered into attachment holes 24A, 24B, 25, and 26 of printed wiring board 23 of the electronic device, as shown in Figure 5; it is attached such that it protrudes toward the exterior, from the gap in the outer case 27 of the terminal device on the opposite side from the switch 3 side of discoid knob 17 on encoder 2.

[0014] Next, the operation of the rotational encoder with a push switch of the present embodiment is described. First, as shown in Figure 6, rotating object 15 rotates centered on cylindrical axis 13, which is in the center of box-shaped case 10 as a result of being made to rotate by application of force in a direction tangential to protuberance 17A from outer case 27 of discoid control knob 17, which is attached to the upper edge of encoder 2; upper elastic contact leg 11 is elastically joined to and slides on radial contact plate 14 on the lower surface thereof, and a pulse signal that is coupled to rotational manipulation of discoid control knob 17 in this contact area is generated.

[0015] This pulse is then transmitted from upper elastic contact leg 11 to lower elastic contact leg 12, and after it is also transmitted to contact plate 9 of attachment plate 1, it is transmitted to the circuits of printed wiring board 23 of the electronic device, via outer connection terminal 8.

[0016] As shown in Figure 7, the entire encoder 2 is moved along guide rails 4 of attachment plate 1 by pressing the protruding part 17A of discoid control knob 17 in opposition to the bias of helical screw spring 19 on attachment plate 1 in a horizontal direction (the direction of arrow H2), to connect the center of the knob and switch 3, and by operating switch 3, using protrusion 21, which is arranged on box-shaped case 10, to push control button 20; the signal is transmitted to the circuits of printed wiring board 23 of the electronic device, via outer connection terminal 22.

[0017] When the pressure applied to discoid control knob 17 is released, encoder 2 is pushed back and returned to the original status thereof, as shown in Figure 6, by the elastic resilience of helical screw spring 19 on attachment plate 1.

[0018] The embodiment described above is constituted such that elastic contact leg 12, protruding downward from the bottom surface of box-shaped case 10, is elastically joined to contact plate 9 of attachment plate 1, as means of transmitting the electrical signal from encoder 2 to connection terminal 8, but a constitution such that the elastic contact leg is made to protrude from attachment plate 1, and is elastically joined to a contact plate on the bottom surface of box-shaped case 10 is also acceptable.

[0019] Figure 8 shows another embodiment of the rotational control electronic part with push switch of the present invention; it prevents control knob 17 from rotating when switch 3 is manipulated by pushing discoid control knob 17, since the rotation of rotating object 15 of encoder part 2 of the rotational encoder with a push switch of the foregoing embodiment is accompanied by a sensation as of clicking into place.

[0020] That is, in Figures 8 and 9, nib 30A on the tip of elastic leg 30 produces a sensation as of clicking into place when discoid control knob 31, in other words, rotating object 28, is rotated with respect to local irregularity 28A, which is arranged radially on the upper surface of rotating object 28 of the encoder, corresponding to rotating object 15 of the foregoing embodiment, and in ordinary status, nib 30A on the tip of elastic leg 30 is halted by the concave part of local irregularity 28A, and moving it therefrom requires slightly more force.

[0021] In each of the foregoing embodiments, rotational encoders were described as examples of electronic parts whereof horizontal rotation is controlled, but other electronic parts, such as rotary variable resistors and the like, are, of course, acceptable.

[0022]

[Effect of the invention] As a result of the present invention as described above, a horizontal rotational part and a push switch can be separately controlled with a single knob, which is advantageous for reducing the size of remote controls and portable electronic devices; in addition, if the rotational part and push switch are manipulated continuously, they can be controlled rapidly and easily, since there is no need to shift the knob-manipulating finger from one knob to another distant knob.

[0023] It is also possible to maintain accurately the positional relationship of the rotational part and the push switch, and to obtain reliable operation during push control, since, as a result of mounting the horizontal rotational part and the push switch on a single attachment plate, and transmitting the electrical signal from the rotational part to the attachment plate via a sliding contact point, these can be handled as a single combined part; in addition, the part can be readily mounted on an electronic device.

[Brief description of the drawings]

[Figure 1] An external perspective view of a rotational encoder with a push switch of an embodiment of the rotational control electronic part with push switch of the present invention

[Figure 2] A perspective view of a contact attachment plate, which is an element of the same embodiment

[Figure 3] A front cross-sectional view of the same embodiment

[Figure 4] A side cross-sectional view of the same embodiment

[Figure 5] A side cross-sectional view of a device used, showing

mounting onto a device used in the same embodiment

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[Figure 6] A partially exploded top view, illustrating a rotational encoder of the same embodiment

[Figure 7] A top view, illustrating a push switch of the same embodiment

[Figure 8] A side cross-sectional view of another embodiment

[Figure 9] An exploded perspective view, illustrating the relationship between the rotating body and elastic web, which are elements in Figure 8

[Figure 1]

[See original for graphic.]

1: contact attachment plate
2: rotational encoder
3: push switch
17: control knob

[Figure 3]

[See original for graphic.]

6

[Legend]

1 contact attachment plate
2 rotational encoder
3 push switch
9 contact plate
12 contact leg
17 control knob
19 helical screw spring

[Figure 2]

[See original for graphic.]

[Figure 4]

[See original for graphic.]

19: helical screw spring

[Figure 5]

[See original for graphic.]

[Figure 6]

[See original for graphic.]

[Figure 7]

[See original for graphic.]

[Figure 8]

[See original for graphic.]

[Figure 9]

[See original for graphic.]

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(72) Inventor: Tamotsu Yamamoto
Matsushita Electric Industrial Co., Ltd.
1006 Oaza Kadoma, Kadoma-shi, Osaka

(72) Inventor: Kazuhiro Enokido
Sony Corporation
6-7-35 Kitashinagawa, Shinagawa-ku, Tokyo

(72) Inventor: Yutaka Yamagishi [name not confirmed]
Sony Corporation
6-7-35 Kitashinagawa, Shinagawa-ku, Tokyo